(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 789 422 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.08.1997 Bulletin 1997/33

(51) Int. Cl.[6]: **H01R 4/02**

(21) Application number: **97101533.4**

(22) Date of filing: **31.01.1997**

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **06.02.1996 SG 9601072**

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(54) Anti-wicking system for electrical connectors

(57) An anti-wicking system is provided in an electrical connector (10) adapted for mounting on a printed circuit board having solderable circuit traces thereon. The connector includes a housing (12) having a plurality of terminal-receiving passages (22). A plurality of terminals (34) are inserted into the passages, with solder tail portions (34b) of the terminals projecting from the housing for solder connection to the circuit traces on the printed circuit board. The housing has at least one projecting portion (40) adjacent the terminals (34) to provide extra housing material which can be heat staked (40A) about the terminals to prevent solder wicking therealong.

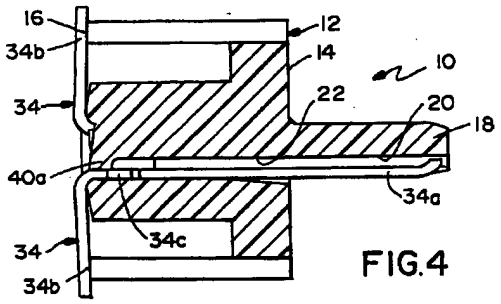

FIG.4

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Description

Field of the Invention

This invention generally relates to the art of electrical connectors and, particularly, to an anti-wicking system in an electrical connector adapted for mounting on a printed circuit board.

Background of the Invention

A wide variety of electrical connectors are adapted for mounting on a printed circuit board. Such connectors typically include dielectric housings having terminal-receiving passages, with solder tail portions or feet of the terminals of the connector projecting from the housing for soldering to appropriate circuit traces on the printed circuit board. The solder tails may be inserted into holes in the board or the tails may form generally planar feet for surface mounting to the board. In either event, the circuit traces on the board are solderable to the solder tails whether the circuit traces are in and about the holes or comprise flat contact pads on the board.

A continuing problem with electrical connectors of the character described above is that flowing solder and flux wet the surface mount pads or the plated-through-holes of the printed circuit board and tend to creep or wick up the terminals of the connector. Wicking, as it is known in the art, is undesirable because it can lead to connector damage, connector inoperability, shorting and poor solder connections.

Heretofore, various approaches have been taken to prevent the phenomenon of solder wicking. Most of these approaches involve extra components and/or materials. For instance, additional mechanical components have been used to surround the terminals or close the terminal-receiving passages to form a mechanical interruption of the solder wicking. Additional materials such as polyester films, Teflon®, epoxy and the like have been used to surround the terminals and/or close the terminal-receiving passages to prevent wicking. Anti-wicking strips, such as of aluminum material, have been used to deter solder wicking.

All of the above approaches involve some form or another of extraneous components, materials, flowing substances and the like which add considerably to the manufacturing costs of the connectors. The present invention is directed to providing a much more simpler approach in forming an effective anti-wicking barrier by heat staking an outside portion of a dielectric housing to prevent wicking of the solder and flux materials along the connector terminals.

Summary of the Invention

An object, therefor , of the invention is to provide a new and improved anti-wicking system in an electrical connector adapted for mounting on a printed circuit board having solderable circuit traces thereon.

In the exemplary embodiment of the invention, the system generally includes a connector housing having a plurality of terminal-receiving passages. A plurality of terminals are inserted into the passages, with solder tail portions of the terminals projecting from the housing for solder connection to the circuit traces on the printed circuit board. The outside of the housing is heat staked about the terminals to prevent solder wicking therealong.

As disclosed herein, the housing is unitary or of one-piece and has a mating end and a terminating end, with the terminal-receiving passages extending in a direction between the ends. The passages have open mouths at the terminating end of the housing. The solder tail portions of the terminals project through the open mouths of the passages at the terminating end of the housing. The housing is heat staked at the terminating end to close and seal the open mouths of the passages.

Specifically, the housing is provided with projecting portions adjacent the open mouths of the passages to form extra housing material which can be heat staked about the terminals and close the passages. In the preferred embodiment, the terminal-receiving passages are in a row along the housing defining a row of the open mouths to the passages. The projecting portions of the housing to provide extra heat-staking material are formed by a singular, outwardly projecting rib running along the row of open mouths of the passages.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a perspective view of the mating end of an electrical connector embodying the concepts of the present invention;

FIGURE 2 is a perspective view of the opposite or terminating end of the connector, prior to heat staking;

FIGURE 3 is a vertical section taken generally along line 3-3 of Figure 2;

FIGURE 4 is a view similar to that of Figure 3, but after heat staking the housing; and

FIGURE 5 is an enlarged, fragmented perspective view of the final heat staked portion of the housing.

Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, and first to Figures 1 and 2, the invention is embodied in an anti-wicking system for an electrical connector, generally designated 10, adapted for mounting on a printed circuit board (not shown). As is well known in the art, the printed circuit board has solderable circuit traces thereon such as plated-through-holes or flat solderable contact pads. The latter interconnects with surface mounted connectors, such as connector 10, as will be described below.

More particularly, connector 10 includes a unitary or one-piece housing, generally designated 12, having a front mating end 14 and a rear terminating end 16. The housing is molded of dielectric material, such as plastic or the like. A mating plug portion 18 projects from mating end 14 and includes a plurality of terminal blade-receiving troughs or grooves 20. A plurality of terminal-receiving passages 22 extend through housing 12 in a direction between mating and terminating ends 14 and 16, respectively. The passages have open mouths 24 at terminating end 16. The passages and the mouths are spaced apart in a row lengthwise of the housing.

Still further, connector housing 12 has a mounting block 26 at each opposite side thereof for mounting a "fitting nail", generally designated 30. The two fitting nails at opposite sides of the housing include generally planar feet 32 for surface connection to mounting pads on the printed circuit board. The fitting nails are stamped and formed of sheet metal material and feet 32 are solderable to the mounting pads on the printed circuit board to secure the connector to the board during the soldering process.

Referring to Figure 3 in conjunction with Figures 1 and 2, terminal-receiving passages 22 can better be seen extending through housing 12 between mating and terminating faces 14 and 16, respectively. It also can be seen that each trough or groove 20 in the outside surface of mating plug portion 18 of the housing simply forms a continuation of one of the terminal-receiving passages.

Still referring to Figure 3 in conjunction with Figures 1 and 2, a plurality of terminals, generally designated 34, are inserted into passages 22 through open mouths 24 in the direction of arrows "A" (Fig. 3). In essence, the terminals are rear-loaded into the connector housing, and the terminals all can be gang-loaded into the connector simultaneously.

Each terminal 34 is generally L-shaped and includes a first leg 34a forming a contact blade extending through a respective one of the terminal-receiving passages 22 and into a respective one of the grooves 22 on the outside of mating plug portion 18 of the housing. The exposed end of contact blade 34a is engageable by a respective contact of a complementary mating connector (n t shown). Each L-shaped terminal 34 includes a second leg 34b bent generally at a right angle as it exits the open mouth 24 of the respective terminal-receiving passage 22. This leg forms a solder tail portion in the form of a generally planar foot for solder connection to one of the flat solderable contact pads on the printed circuit board. Barbs or teeth 34c are formed on opposite edges of first leg 34a of each terminal 34. These barbs bite into the plastic material of housing 12 within passages 22 and comprise a primary retention means for holding the terminals in proper position in the passages of the housing.

It can be seen in Figure 3 that a space 36 exists between terminal blade 34a and the inside of its respective terminal-receiving passage 22. This is true for all of the terminals along the row thereof. Without some form of anti-wicking system, solder or flux material may tend to wick into this space due to capillary action and along the terminal blade portion 34a and create problems ranging from single terminal inoperability to actual shorting between the terminal blades. Heretofore, in order to solve this problem, extraneous components have predominantly been used, such as providing an extraneous connector component or components to block the passages; or to fill the passages with an extra material such as epoxy; or to provide a separate anti-wicking barrier such as plastic films or aluminum strips. Generally, the present invention contemplates a simple procedure of heat staking the housing to close the passages at the open mouths 24 and thereby prevent the solder material from wicking into the passages along the terminals.

More particularly, and still referring to Figures 2 and 3, the preferred embodiment of the invention employs a projecting portion or portions of the housing adjacent the terminals to provide extra housing material which can be heat staked about the terminals to prevent solder wicking therealong. As disclosed, an outwardly projecting rib 40 is molded integrally with the housing and runs the length of the row of terminals. The terminals are bent in an alternating array to opposite ends of the housing, whereby it can best be seen in Figure 2 that rib 40 runs along the row of terminals between the alternatingly outwardly bent solder tail portions 34b of the terminals. The rib also is immediately adjacent open mouths 24 of the terminal-receiving passages 22, as best seen in Figure 3.

Figures 4 and 5 show how the extra material of rib 40 of housing 12 has been heat-staked, as at 40a, to completely close open mouths 24 and thereby completely close the terminal-receiving passages 22 at terminating end 16 of the housing. Therefore, the heat staked portions of the housing form a barrier to prevent any substantial amount of solder or flux material from wicking into the housing along the terminals. In addition, the heat staked portions comprise a secondary retention means for holding the terminals in proper position in the passages of the housing.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be con-

sidered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

Claims

1. An anti-wicking system in an electrical connector (10) adapted for mounting on a printed circuit board having solderable circuit traces thereon, comprising:

   a one-piece dielectric housing (12) having a mating end (14) and a terminating end (16) with a plurality of terminal-receiving passages (22) extending in a direction between the ends, the passages having open mouths (24) at said terminating end;
   a plurality of terminals (34) inserted into the passages (22) through the open mouths (24) thereof, with solder tail portions (34b) of the terminals projecting from the terminating end (16) of the housing (12) for soldering to the circuit traces on the printed circuit board; and
   wherein the housing is heat staked (40A) at the terminating end (16) to close the open mouths (24) of the passages (22) and prevent solder or flux material from wicking along the terminals into the passages.

2. The anti-wicking system of claim 1 wherein the terminal-receiving passages (22) in said housing are in a row defining a row of said open mouths (24), the housing being heat staked (40A) along the row.

3. The anti-wicking system of claim 2 wherein the housing (12) has an outwardly projecting rib (40) extending along the row of open mouths (24) of the passages (22) to provide extra housing material which can be heat staked (40A) to close and seal the open mouths.

4. The anti-wicking system of claim 1 wherein the solder tail portions (34b) of the terminals (34) are bent generally at right angles as they exit the open mouths (24) of the passages (22) for surface mounting to the circuit board.

5. The anti-wicking system of claim 1, including primary retention means (34c) for holding the terminals (34) in proper position in the passages (22) of the housing (12), the heat staked housing (40A) comprising a secondary retention means.

6. A method of providing an anti-wicking system for an electrical connector (10) adapted to be mounted on a printed circuit board having solderable circuit traces thereon, comprising the steps of:

   providing a unitary dielectric housing (12) with a plurality of terminal-receiving passages (22);
   inserting a plurality of terminals (34) into the passages (22), with solder tail portions (34b) of the terminals projecting from the housing (12) for solder connection to the circuit traces on the printed circuit board; and
   heat staking (40A) the unitary housing (12) from the outside thereof about the terminals (34) and closing said passages (22) to prevent solder and flux material from wicking along the terminals into the passages.

7. The method of claim 15 wherein the housing is provided with extra housing material (40) which can be heat staked, and heat staking that extra material about the terminals (34) to close the passages (22).

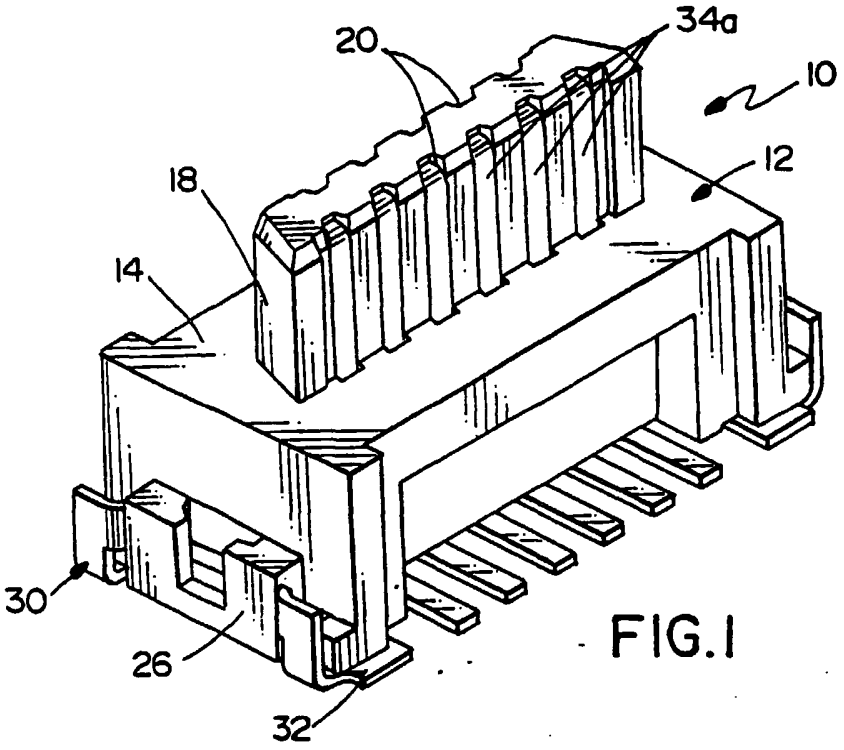

FIG.1

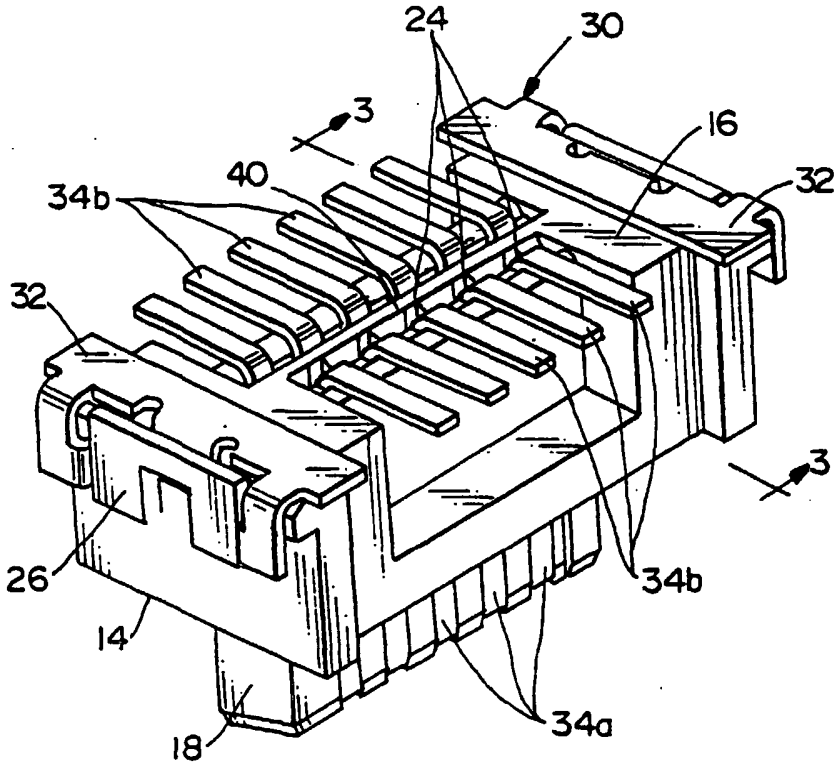

FIG.2

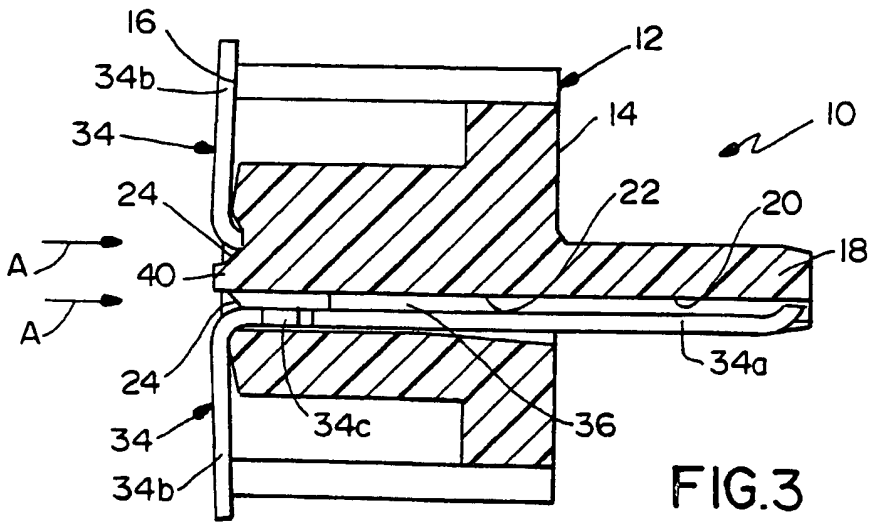

FIG.3

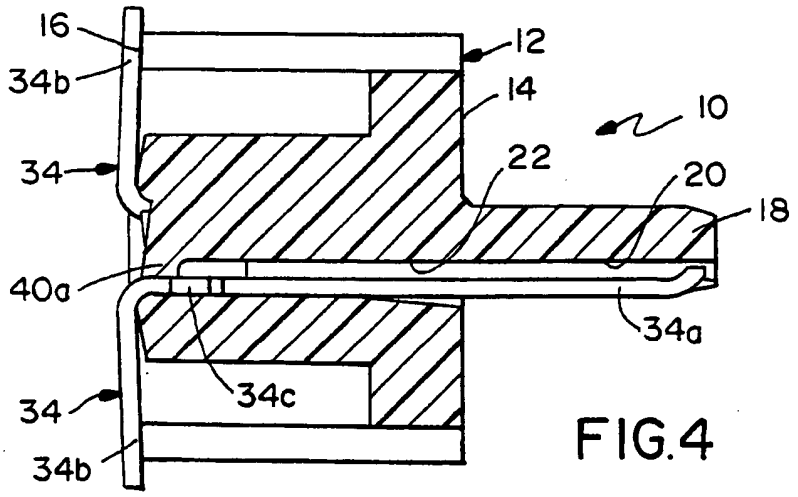

FIG.4

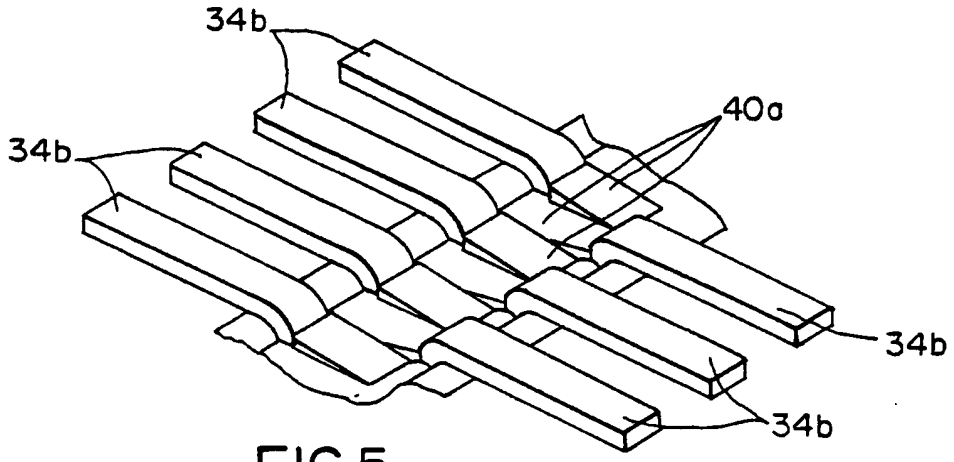

FIG.5

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 789 422 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
14.01.1998 Bulletin 1998/03

(43) Date of publication A2:
13.08.1997 Bulletin 1997/33

(21) Application number: **97101533.4**

(22) Date of filing: **31.01.1997**

(51) Int. Cl.[6]: **H01R 4/02**, H01R 9/09

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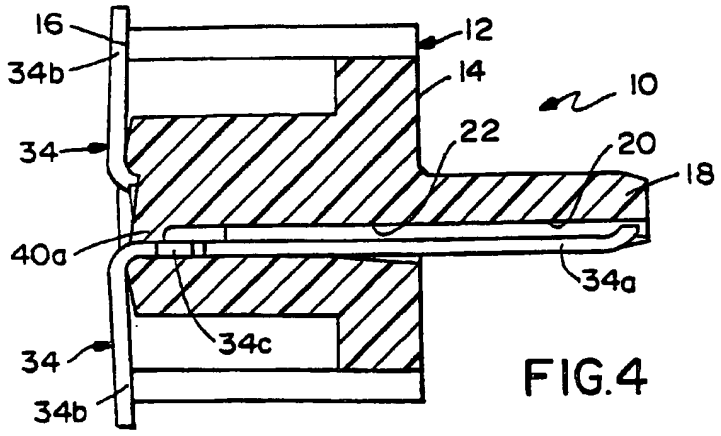

FIG.4

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EUROPEAN SEARCH REPORT

Application Number
EP 97 10 1533

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 828 515 A (SENOR RONALD ET AL) 9 May 1989 * column 2, line 6-11 * * column 2, line 48 - column 3, line 68 * * figures 2-4B *	1-3,5	H01R4/02 H01R9/09
Y		4	
X	US 4 533 187 A (KIRKMAN MICHAEL) 6 August 1985 * column 5, line 38 - column 6, line 61 * * figures 6-9B *	1,2,5	
X	US 4 114 008 A (LUETZOW EDWIN J) 12 September 1978 * abstract; figures 1-5 * * column 3, line 41 - column 4, line 64 *	1,2,5	
X	US 4 010 992 A (CRIMMINS DAVID J ET AL) 8 March 1977 * column 4, line 64 - column 5, line 55 * * figures 2-8 *	1,2,5	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
P,X	US 5 590 463 A (FELDMAN STEVEN ET AL) 7 January 1997 * column 2, line 37 - column 3, line 13 * * column 3, line 50-59 * * column 4, line 32-40 * * figures 1-6 *	1,2,4	H01R
Y	WO 93 02491 A (DU PONT) 4 February 1993 * abstract; figures 1-3 *	4	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 November 1997	Schaap, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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